

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau



(43) International Publication Date
5 August 2004 (05.08.2004)

PCT

(10) International Publication Number
WO 2004/066283 A1

(51) International Patent Classification⁷:

G11B 7/007

(74) Agent: PARK, Lae Bong; 1Fl., Dongun Bldg., 413-4, Dogok 2-dong, Kangnam-gu, Seoul 135-272 (KR).

(21) International Application Number:

PCT/KR2004/000107

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(30) Priority Data:

10-2003-0004488 23 January 2003 (23.01.2003) KR
10-2003-0008317 10 February 2003 (10.02.2003) KR

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (for all designated States except US): LG Electronics Inc. [KR/KR]; 20, Yido-dong, Youngdungpo-gu, 150-010 Seoul (KR).

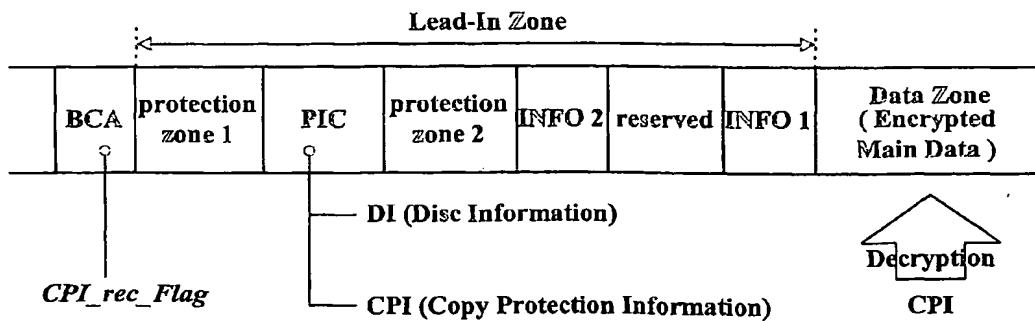
Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: RECORDING MEDIUM WITH COPY PROTECTION INDICATING INFORMATION AND APPARATUS AND METHODS FOR FORMING, RECORDING, REPRODUCING AND RESTRICTING REPRODUCTION OF THE RECORDING MEDIUM

WO 2004/066283 A1



(57) Abstract: A recording medium, such as a high-density and/or read-only recording medium, such as BD-ROM, which includes copy protection indicating information, which can identify whether copy protection information is needed or not for the playback of contents stored on the recording medium, and to methods and apparatuses for forming, recording, and reproducing data on the recording medium.

DESCRIPTION

RECORDING MEDIUM WITH COPY PROTECTION INDICATING INFORMATION AND APPARATUS AND METHODS FOR FORMING, RECORDING, REPRODUCING AND RESTRICTING REPRODUCTION OF THE RECORDING MEDIUM

5

1. TECHNICAL FIELD

The present invention relates to a recording medium such as BD-ROM (Blu-ray Disc ROM), which includes copy protection indicating information and an apparatus and methods for forming, recording, reproducing, and restricting reproduction of illegally duplicated recording media.

2. BACKGROUND ART

Recently, standardization of a new high-density optical disc, a rewritable Blu-ray disc (BD-RE: Blu-ray Disc-Rewritable), have been under development where large quantities of high quality video and audio data can be recorded. Once the standard of a BD-RE has been established, products adopting the new optical discs are expected to be commercially available in the near future.

As illustrated in FIG. 1, a BD-RE has an inner hole, clamping area, transition area, BCA (Burst Cutting Area) area, and lead-in area, located in sequential order along radial direction. A data area and lead-out area reside in the center and outermost annulus of the disc, respectively.

The lead-in area is partitioned into a first guard (Guard 1) area, PIC (Permanent Information & Control data) area, a second guard (Guard 2) area, Info 2 area, OPC (Optimum Power Calibration) area, etc. The first guard area and PIC area are

pre-recorded areas, whereas the remaining lead-in areas, data area, and lead-out area correspond to rewritable areas which can be overwritten with new data.

General information of a disc which needs to be
5 permanently preserved may be recorded in the PIC area, which
can be encoded in wobbled grooves of a track by HFM (High
Frequency Modulation) method. HFM Grooves are modulated in the
radial direction with a rather high bandwidth signal, to
create a data channel for replicated information with
10 sufficient capacity and data rate. As shown in FIG. 2,
encoding data into wobbled groove can be performed by bi-phase
modulation and thus recording.

In this modulation method a bit with value 0 is
represented by a transition at the start of the bit cell and a
15 bit with value 1 is represented by a transition at the start
and in the middle of the bit cell. The modulated bits are
recorded on the disc by a deviation of the groove from its
average centerline as indicated in the FIG.2. The length of
each bit cell shall be 36T, where T corresponds to the length
20 of a channel bit in the Rewritable data areas.

Along with the development of a BD-RE, has been the
development of a corresponding read-only disc, a read-only
Blu-ray disc (hereinafter, referred to as 'BD-ROM'). As shown
in FIG. 3, the BD-ROM disc may include an inner area, clamping
25 area, transition area, information area, and rim area.

The main data of an audio/video (A/V) stream recorded in
a data zone within an information area can be recorded with
encryption with copy protection information (CPI) to prevent
unauthorized copy.

30 Various disc information (DI) about the disc, such as the
type of a disc, may be recorded in the PIC area within the
information area. When encrypted main data are recorded in the
data zone, copy protection information (CPI) for decryption

can also be recorded in PIC area.

When an optical disc apparatus playing a recording medium performs initial servo operations in accordance with the insertion of a disc, copy protection information (CPI) 5 recorded in the PIC area is detected. If main data recorded in a pre-recorded data area is found to be encrypted, the main data is output after decryption using the copy protection information.

Even when copy protection information is not recorded in 10 the PIC area because the contents recorded in data area of a BD-ROM are not encrypted, an optical disc apparatus performing initial servo operations still performs a series of operations to detect copy protection information in the PIC area under the assumption that encryption has been applied to the 15 contents. Such a preliminary operation can cause a delay in the playback of actual data. Also, if any data is recorded on the rewritable disk, i.e., BD-RE, or recordable disk, i.e., BD-WO and its data is copy protected, it has same problem when the data is reproduced.

20 Furthermore, in case that the copy protection information is not detected, it cannot distinguish whether there is no copy protection information initially because the disc is illegal medium, or there is no copy protection information because the disc is legal and copy-free medium.

25 3. DISCLOSURE OF INVENTION

In exemplary embodiments, the present invention is directed to a recording medium, such as a high-density and/or read-only recording medium, such as BD-ROM, which includes copy protection indicating information, which can identify 30 whether copy protection information is needed or not for the playback of contents stored on the recording medium, and to methods and apparatuses for forming, recording, and

reproducing data on the recording medium.

In exemplary embodiments, the present invention is directed to a recording medium, such as a high-density and/or read-only recording medium, such as BD-ROM, which includes information in a particular area indicating whether or not copy protection information to decrypt recorded contents is present, and to methods and apparatuses for forming, recording, and reproducing data on the recording medium.

In exemplary embodiments, the present invention is directed to a recording medium, such as a high-density and/or read-only recording medium, such as BD-ROM, which includes information regarding the presence of copy protection information in the disc information, and to methods and apparatuses for forming, recording, and reproducing data on the recording medium.

In exemplary embodiments, the present invention is directed to a recording medium, such as a high-density and/or read-only recording medium, such as BD-ROM, which includes information regarding the presence of copy protection information as header information of a copy protection information field, and to methods and apparatuses for forming, recording, and reproducing data on the recording medium.

In exemplary embodiments, the present invention is directed to a recording medium, such as a high-density and/or read-only recording medium, such as BD-ROM, which includes copy protection indicating information, which is used to determine whether copy protection information is present and whether decryption is necessary, and to methods and apparatuses for forming, recording, and reproducing data on the recording medium.

In exemplary embodiments, the present invention is directed to a recording medium, such as a high-density and/or read-only recording medium, such as BD-ROM, which includes

copy protection indicating information, which is used to determine whether copy protection information is present and whether decryption is necessary, playback of contents is directly started, irrespective of whether or not recorded 5 contents have been encrypted, and to methods and apparatuses for forming, recording, and reproducing data on the recording medium.

In exemplary embodiments, the present invention is directed to a method for copy protection, which includes the 10 steps of utilizing copy protection indicating information to indicate whether or not the recording medium contains copy protection information for use in decrypting the data, to reproduce the data, wherein the copy protection indicating information and/or the copy protection information are 15 recorded in wobbled pre-pit pattern on an area of the recording medium.

In exemplary embodiments, the present invention is directed to a method for copy protection, which includes the steps of detecting copy protection indicating information 20 indicating whether or not the recording medium contains copy protection information for use in decrypting the data, wherein the copy protection indicating information and/or the copy protection information are recorded in wobbled pre-pit pattern on an area of the recording medium; and playing the data 25 utilizing the copy protection information if the recording medium contains copy protection information for use in decrypting the data, or playing the data directly without utilizing the copy protection information, if the recording medium does not contain copy protection information for use in 30 decrypting the data, based on the detected copy protection indicating information.

In exemplary embodiments, the present invention is directed to a method for copy protection, which includes the

steps of utilizing copy protection indicating information to indicate whether or not the recording medium contains copy protection information for use in decrypting the data, wherein the copy protection indicating information and/or the copy 5 protection information are recorded in wobbled pre-pit pattern on an area of the recording medium.

In exemplary embodiments, the present invention is directed to an apparatus for copy protection, wherein said apparatus utilizes copy protection indicating information to 10 determine whether or not the recording medium contains copy protection information for use in decrypting the data, to reproduce the data based on the copy protection indicating information and the copy protection information, wherein the copy protection indicating information and/or the copy 15 protection information are recorded in wobbled pre-pit pattern on an area of the recording medium.

In exemplary embodiments, the present invention is directed to an apparatus for copy protection, which includes a detector detecting signals recorded on the recording medium, 20 the signal including copy protection indicating information to determine whether or not the recording medium contains copy protection information for use in decrypting the data, wherein the copy protection indicating information and/or the copy protection information are recorded in wobbled pre-pit pattern 25 on an area of the recording medium ; and a signal processor for playing the data utilizing the copy protection information if the recording medium contains copy protection information for use in decrypting the data, or playing the data directly without utilizing the copy protection information, if the 30 recording medium does not contain copy protection information for use in decrypting the data based on the copy protection indicating information.

4. BRIEF DESCRIPTION OF DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention, illustrate exemplary embodiments of the invention, and together with the 5 description, serve to explain the principles of the present invention.

In the drawings:

FIG. 1 is a diagram illustrating the disc structure of a conventional rewritable Blu-ray disc (BD-RE);

10 FIG. 2 is a diagram illustrating the high frequency modulation (HFM) groove formed in the PIC area of a rewritable Blu-ray disc;

FIG. 3 is a diagram illustrating each area allocated in a read-only Blu-ray disc (BD-ROM) in an exemplary embodiment of 15 the present invention;

FIG. 4 is a diagram illustrating an exemplary embodiment wherein information regarding the presence of copy protection information is recorded in the PIC area of a Blu-ray disc according to an exemplary embodiment of the present invention;

20 FIG. 5 is a diagram illustrating the fields of disc information recorded and managed in a high-density Blu-ray disc, wherein a flag indicating the presence of copy protection information is included in an exemplary embodiment of the present invention;

25 FIG. 6 is a diagram illustrating an exemplary embodiment wherein recorded in the BCA area of a Blu-ray disc according to the present invention is information indicating whether or not copy protection information is recorded;

FIG. 7 is a diagram illustrating a process restoring data 30 encoded in wobbled pits according to an exemplary embodiment of the present invention;

FIG. 8 is a diagram illustrating a simplified structure of an optical disc apparatus capable of playing a high-density

Blu-ray disc in accordance with an exemplary embodiment of the present invention;

FIG. 9 is a flowchart illustrating the process of playing a high-density Blu-ray optical disc according to an exemplary embodiment of the present invention; and
5

FIGS. 10 and 11 are diagrams illustrating respectively the exemplary embodiments according to the present invention, wherein recorded in a Blu-ray disc are information indicating whether or not copy protection information is recorded.

10 5. MODES FOR CARRYING OUT THE INVENTION

Hereinafter, a high-density read-only recording medium according to exemplary embodiments of the present invention and exemplary embodiments of apparatuses and methods for forming, recording, and reproducing copy protection 15 information will be described in detail with reference to the appended drawings.

As stated above with reference to FIG. 3, a read-only Blu-ray disc (BD-ROM) according to exemplary embodiments of the present invention has a disc structure including inner 20 area, clamping area, transition area, information area, and rim area.

As shown in FIG. 4, disc information corresponding to general information of a disc as well as encrypted main data recorded in data zone, for example, copy protection 25 information required to decrypt A/V data streams may be recorded in the PIC area allocated in the information area.

When the main data is recorded without encryption in the data zone, the copy protection information need not be particularly recorded in the PIC area.

30 Accordingly, a flag to indicate whether or not copy protection information is recorded in the PIC area may be included in the disc information recorded in the PIC area. The

flag (CPI_rec_Flag) indicates the presence of copy protection information and may have a recording size of one byte.

As shown in FIG. 5, one byte is allocated to record the flag indicating the presence of copy protection information 5 within the area reserved for the disc information.

Also, the disc information in the PIC area can be recorded for several times. The flag byte may be recorded only in the first disc information among multiple of disc information which are recorded repeatedly in the PIC area.

10 As illustrated in FIG. 6, the flag indicating whether or not the copy protection information is recorded may be recorded in another area, e.g., the BCA (Burst Cutting Area) area allocated in the inner ring of the PIC area wherein copy protection information is recorded.

15 Copy protection information, along with the flag indicating the presence thereof, may be encoded and recorded in wobbled pits rather than in straight pits where data are recorded in general case. To this purpose, pits may be formed in wobbled pattern (or in a zigzag pattern) within as many 20 track sections as needed. Also, it may be encoded and recorded in wobbled pits and straight pits alternatively and/or intermittently within the PIC area. Otherwise, it may be selectively or repeatedly recorded on other area except for the PIC area. It is recorded by HFM groove wobbled method such 25 as BD-RE.

The copy protection information includes a key value for encrypting the main data to be recorded on data area.

FIG. 7 is a diagram illustrating an example where data is encoded in wobbled pits by bi-phase modulation, whereby data 30 are detected. In FIG. 7, the value of '0101' is encoded in bi-phase modulated form, e.g., bi- phase modulated HFM Groove, along with wobbled pattern of wobbled pits. The recording example of wobbled pits in FIG. 7 comprises 36Ts (including

marks and spaces) where six 3T signals (mark) make up of the value of one bit. In the example, left and right transition of a sequence of six pits denoting '1' and a sequence of six pits denoting '0' are provided in opposite directions.

5 As shown in FIG. 7, the structure by bi-phase modulation is different from the structure illustrated in FIG.2. That is, the method of FIG.2 has a bit with value 0, which is represented by a transition at the start of the bit cell and a bit with value 1, which is represented by a transition at the 10 start and in the middle of the bit cell. Otherwise, the method of FIG.7 has a bit with value 0, which is represented by a transition at the start of low and in the middle of high, and a bit with value 1, which is represented by the transition in the opposite direction. The combination of bits consists of 15 data to detect information recorded as wobbled pit. The wobbled pit can be copy protection information, i.e., key data to decrypt main data recorded on the data zone of the recording medium as shown in FIG.4A to 4F

That is, the wobbled pit data can be reproduced or 20 detected only when the bi-phased modulation data is detected or reproduced normally. And also, reproduction or decryption of main data is possible only when the wobbled pit data for copy protection is reproduced or detected using the normally detected or reproduced bi-phase modulation data.

25 When information is recorded in pits, identical pits need not be repeated but modulated varying pits (2T-8T) in accordance with input information may be recorded. In this case, too, however, the position of a pit sequence (namely, phase) is shifted approximately by every 18Ts in order to 30 encode data into wobbled pattern of wobbled pits.

The reflected light reflected from wobbled pits recorded in such a manner undergoes a photoelectric transform by four quadrant light receiving elements 13-16.

As illustrated in FIG. 7, The photoelectrically transformed electrical signals (Ea, Eb, Ec, Ed) are amplified by a circuit for conventional push-pull track control. More specifically, left and right-side signals of the track (Ea+Eb, 5 Ec+Ed) are amplified by respective amplifiers 10, 11 and the difference signal 501 of the left and right-side signals ((Ea+Eb) - (Ec+Ed)) is output by a differential amplifier 12. When the difference signal 501 is converted a binary signal based on whether its level is above or below a reference, 10 encoded data in wobbled pattern of wobbled pits may be obtained.

Because signals detected from the wobbled pattern of wobbled pits are not available externally, even if data played from a BD-ROM were copied onto another recording medium other 15 than the BD-ROM, playback of the copied data would be impossible.

Instead of recording data in wobbled pattern, if data were recorded in the PIC area according to a different agreement for recording format between manufactures having 20 legal authorities, copying a BD-ROM by unauthorized manufactures can also be made more difficult.

FIG. 8 is a simplified diagram illustrating an optical disc apparatus playing a recording medium of a disc. The apparatus includes an optical pickup 11; VDP (Video Disc Play) 25 system 12 performing signal processing and servo control; and a D/A converter 13. The optical disc apparatus may perform playback processing according to whether or not copy protection information is recorded, as described in conjunction with FIG. 9.

30 The VDP system 12 of the disc apparatus detects and checks a flag (CPI_rec_Flag) indicating whether or not copy protection information among disc information recorded in the PIC area or encoded in the wobbled pits of an inserted BD-ROM

is recorded (S11); otherwise, a flag recorded in the BCA area of a BD-ROM is detected (S11), whereby it is determined whether or not copy protection information is recorded.

If the flag is detected, its value is checked (S13). If 5 the value indicates that copy protection information is recorded, the VDP system 12 of the optical disc apparatus performs (S14) the operation of detecting copy protection information recorded in the PIC area or encoded in the wobbled pits; thereafter, by using the copy protection information, a 10 series of data play operations decrypting and playing encrypted data recorded in the data zone are performed (S15).

When the value of the flag indicates the absence of copy protection information or the flag indicating the presence of copy protection information is not detected, the VDP system 12 15 omits unnecessary operations to detect non-existent copy protection information in the PIC area, but directly performs the operations of reading out recorded contents in the data area.

As shown in the exemplary embodiment of FIG. 5, the flag 20 indicating whether or not copy protection information is recorded, instead of being included and recorded in the disc information, may be recorded in the PIC area together with copy protection information.

FIG. 10 is an exemplary embodiment illustrating such an 25 arrangement. As shown in the exemplary embodiment of FIG. 10, the flag (CPI_rec_Flag) indicating the presence of copy protection information may be recorded as header information of copy protection information field.

The flag indicating whether or not copy protection 30 information is recorded may have a recording size of one byte. When the value of the flag is '0000 0000', the flag indicates that copy protection information is not recorded (in this case, a succeeding copy protection information field may be filled

with '00'.) When the value of the flag is '0000 1111', the flag indicates that copy protection information is recorded.

In other exemplary embodiments, copy protection information having a flag indicating whether or not copy protection information is recorded as a header information can be recorded in a particular recording area other than the PIC area, for example, the BCA area.

Copy protection information having a flag indicating whether or not copy protection information is recorded can be recorded in a field of disc information stored in the PIC area. Alternatively, it may be recorded as an independent structure from the disc information.

FIG. 11 describes an exemplary embodiment wherein copy protection information is recorded in the PIC area independently of the disc information.

In the exemplary embodiment of FIG. 11, the flag indicating whether or not copy protection information is recorded also appears in the header of copy protection information. When the value of the flag is '0000 0000', the flag indicates that copy protection information is not recorded (In this case, succeeding copy protection information field may be filled with the value of '00'.) When the value of the flag is '0000 1111', the flag indicates that copy protection information is recorded.

As described above, a high-density read-only recording medium and methods for recording copy protection information/playing thereof according to exemplary embodiments of the present invention allows a direct playback of contents stored in a high-density read-only disc unless the contents had been encrypted, whereas proper playback is achieved by reading out decryption information from the disc when encryption has been applied to the contents.

In addition, information for decoding encrypted data is

recorded in a form of copy-resistant wobbled pits, whereby illegal copy of the contents stored in a high-density read-only disc is prohibited.

The foregoing description of exemplary embodiments of the 5 present invention has been presented for purposes of illustration; therefore, those skilled in the art may utilize the invention and various embodiments with improvements, modifications, substitutions, or additions within the spirit and scope of the invention as defined by the following 10 appended claims.

CLAIMS

1. A recording medium including recorded data, comprising:

copy protection indicating information indicating whether
5 or not the recording medium contains copy protection
information for use in decrypting the recorded data, wherein
the copy protection indicating information and/or the copy
protection information are recorded in wobbled pre-pit pattern
on an area of the recording medium.

10 2. The recording medium according to claim 1, wherein the
data is reproduced utilizing the copy protection information
if the recording medium contains copy protection information
for use in decrypting the data, or the data is reproduced
directly without utilizing the copy protection information, if
15 the recording medium does not contain copy protection
information for use in decrypting the data.

3. The recording medium according to claim 2, wherein the
recording medium does not contain copy protection information
for use in decrypting the data if the copy protection
20 indicating information indicates the recording medium does not
contain copy protection information.

4. The recording medium according to claim 2, wherein the
recording medium does not contain copy protection information
for use in decrypting the data if the copy protection
25 indicating information indicates the recording medium contains
copy protection information, but a value of the copy
protection information indicates that copy protection
information is not present.

5. The recording medium according to claim 2, wherein the
30 recording medium contains copy protection information for use
in decrypting the data when the copy protection indicating

information indicates the recording medium contains copy protection information and a value of the copy protection information indicates that copy protection information is present.

5 6. The recording medium according to claim 5, wherein decrypting the data utilizing the copy protection information precedes playback of the data.

7. A method of forming a recording medium, comprising:
forming a recordable area for storing recorded data;
10 forming an area on the recording medium for storing copy protection indicating information indicating whether or not the recording medium contains copy protection information for use in decrypting the recorded data, wherein the copy protection indicating information and/or the copy protection
15 information are formed as wobbled pre-pit pattern on an area of the recording medium.

8. The method according to claim 7, wherein the data may be reproduced utilizing the copy protection information if the recording medium contains copy protection information for use
20 in decrypting the data, or the data may be reproduced directly without utilizing the copy protection information, if the recording medium does not contain copy protection information for use in decrypting the data.

9. The method according to claim 8, wherein the recording
25 medium does not contain copy protection information for use in decrypting the data if the copy protection indicating information indicates the recording medium does not contain copy protection information.

10. The method according to claim 8, wherein the recording
30 medium does not contain copy protection information for use in decrypting the data if the copy protection indicating information indicates the recording medium contains copy protection information, but a value of the copy

protection information indicates that copy protection information is not present.

11. The method according to claim 8, wherein the recording medium contains copy protection information for use 5 in decrypting the data when the copy protection indicating information indicates the recording medium contains copy protection information and a value of the copy protection information indicates that copy protection information is present.

10 12. The method according to claim 11, wherein decrypting the data utilizing the copy protection information precedes playback of the data.

13. A method of reproducing data from a recording medium, comprising:

15 utilizing copy protection indicating information to indicate whether or not the recording medium contains copy protection information for use in decrypting the data, to reproduce the data, wherein the copy protection indicating information and/or the copy protection information are 20 recorded in wobbled pre-pit pattern on an area of the recording medium.

14. The method according to claim 13, further comprising reproducing the data utilizing the copy protection information if the recording medium contains copy protection information 25 for use in decrypting the data, or reproducing the data directly without utilizing the copy protection information, if the recording medium does not contain copy protection information for use in decrypting the data.

15. The method according to claim 14, wherein the recording medium does not contain copy protection information 30 for use in decrypting the data if the copy protection indicating information indicates the recording medium does not contain copy protection information.

16. The method according to claim 14, wherein the recording medium does not contain copy protection information for use in decrypting the data if the copy protection indicating information indicates the recording medium contains 5 copy protection information, but a value of the copy protection information indicates that copy protection information is not present.

17. The method according to claim 14, wherein the recording medium contains copy protection information for use 10 in decrypting the data when the copy protection indicating information indicates the recording medium contains copy protection information and a value of the copy protection information indicates that copy protection information is present.

15 18. The method according to claim 17, wherein said playing includes decrypting the data utilizing the copy protection information.

19. A method for playing data of a recording medium, comprising:

20 detecting copy protection indicating information indicating whether or not the recording medium contains copy protection information for use in decrypting the data, wherein the copy protection indicating information and/or the copy protection information are recorded in wobbled pre-pit pattern 25 on an area of the recording medium; and

playing the data utilizing the copy protection information if the recording medium contains copy protection information for use in decrypting the data, or playing the data directly without utilizing the copy protection 30 information, if the recording medium does not contain copy protection information for use in decrypting the data, based on the detected copy protection indicating information.

20. The method according to claim 19, wherein the

recording medium does not contain copy protection information for use in decrypting the data if the copy protection indicating information indicates the recording medium does not contain copy protection information.

5 21. The method according to claim 19, wherein the recording medium does not contain copy protection information for use in decrypting the data if the copy protection indicating information indicates the recording medium contains copy protection information, but a value of the copy
10 protection information indicates that copy protection information is not present.

22. The method according to claim 19, wherein the recording medium contains copy protection information for use in decrypting the data when the copy protection indicating
15 information indicates the recording medium contains copy protection information and a value of the copy protection information indicates that copy protection information is present.

23. The method according to claim 22, wherein said playing includes decrypting the data utilizing the copy protection information.

24. A method of recording data on a recording medium, comprising:

utilizing copy protection indicating information to
25 indicate whether or not the recording medium contains copy protection information for use in decrypting the data, wherein the copy protection indicating information and/or the copy protection information are recorded in wobbled pre-pit pattern on an area of the recording medium.

30 25. The method according to claim 24, wherein the data may be reproduced utilizing the copy protection information if the recording medium contains copy protection information for use in decrypting the data, or the data may be reproduced

directly without utilizing the copy protection information, if the recording medium does not contain copy protection information for use in decrypting the data.

26. The method according to claim 25, wherein the
5 recording medium does not contain copy protection information
for use in decrypting the data if the copy protection
indicating information indicates the recording medium does not
contain copy protection information.

27. The method according to claim 25, wherein the
10 recording medium does not contain copy protection information
for use in decrypting the data if the copy protection
indicating information indicates the recording medium contains
copy protection information, but a value of the copy
protection information indicates that copy protection
15 information is not present.

28. The method according to claim 25, wherein the
recording medium contains copy protection information for use
in decrypting the data when the copy protection indicating
information indicates the recording medium contains copy
20 protection information and a value of the copy protection
information indicates that copy protection information is
present.

29. The method according to claim 28, wherein decrypting
the data utilizing the copy protection information precedes
25 playback of the data.

30. An apparatus for reproducing data from a recording
medium, said apparatus utilizing copy protection indicating
information to determine whether or not the recording medium
contains copy protection information for use in decrypting the
30 data, to reproduce the data based on the copy protection
indicating information and the copy protection information,
wherein the copy protection indicating information and/or the
copy protection information are recorded in wobbled pre-pit

pattern on an area of the recording medium.

31. The apparatus according to claim 30, wherein said apparatus reproduces the data utilizing the copy protection information if the recording medium contains copy protection information for use in decrypting the data, or reproduces the data directly without utilizing the copy protection information, if the recording medium does not contain copy protection information for use in decrypting the data.

32. The apparatus according to claim 31, wherein said apparatus determines the recording medium does not contain copy protection information for use in decrypting the data if the copy protection indicating information indicates the recording medium does not contain copy protection information.

33. The apparatus according to claim 31, wherein said apparatus determines the recording medium does not contain copy protection information for use in decrypting the data if the copy protection indicating information indicates the recording medium contains copy protection information, but a value of the copy protection information indicates that copy protection information is not present.

34. The apparatus according to claim 31, wherein said apparatus determines the recording medium contains copy protection information for use in decrypting the data when the copy protection indicating information indicates the recording medium contains copy protection information and a value of the copy protection information indicates that copy protection information is present.

35. The apparatus according to claim 34, wherein said apparatus decrypts the data utilizing the copy protection information.

36. An apparatus for reproducing data from a recording medium, comprising:

a detector detecting signals recorded on the recording

medium, the signal including copy protection indicating information to determine whether or not the recording medium contains copy protection information for use in decrypting the data, wherein the copy protection indicating information 5 and/or the copy protection information are recorded in wobbled pre-pit pattern on an area of the recording medium ; and

a signal processor for playing the data utilizing the copy protection information if the recording medium contains copy protection information for use in decrypting the data, or 10 playing the data directly without utilizing the copy protection information, if the recording medium does not contain copy protection information for use in decrypting the data based on the copy protection indicating information.

37. The apparatus according to claim 36, wherein said 15 signal processor determines the recording medium does not contain copy protection information for use in decrypting the data if the copy protection indicating information indicates the recording medium does not contain copy protection information.

20 38. The apparatus according to claim 36, wherein said signal processor determines the recording medium does not contain copy protection information for use in decrypting the data if the copy protection indicating information indicates the recording medium contains copy protection information, but 25 a value of the copy protection information indicates that copy protection information is not present.

39. The apparatus according to claim 36, wherein said signal processor determines the recording medium contains copy protection information for use in decrypting the data when the 30 copy protection indicating information indicates the recording medium contains copy protection information and a value of the copy protection information indicates that copy protection information is present.

40. The apparatus according to claim 39, wherein said signal processor decrypts the data utilizing the copy protection information.

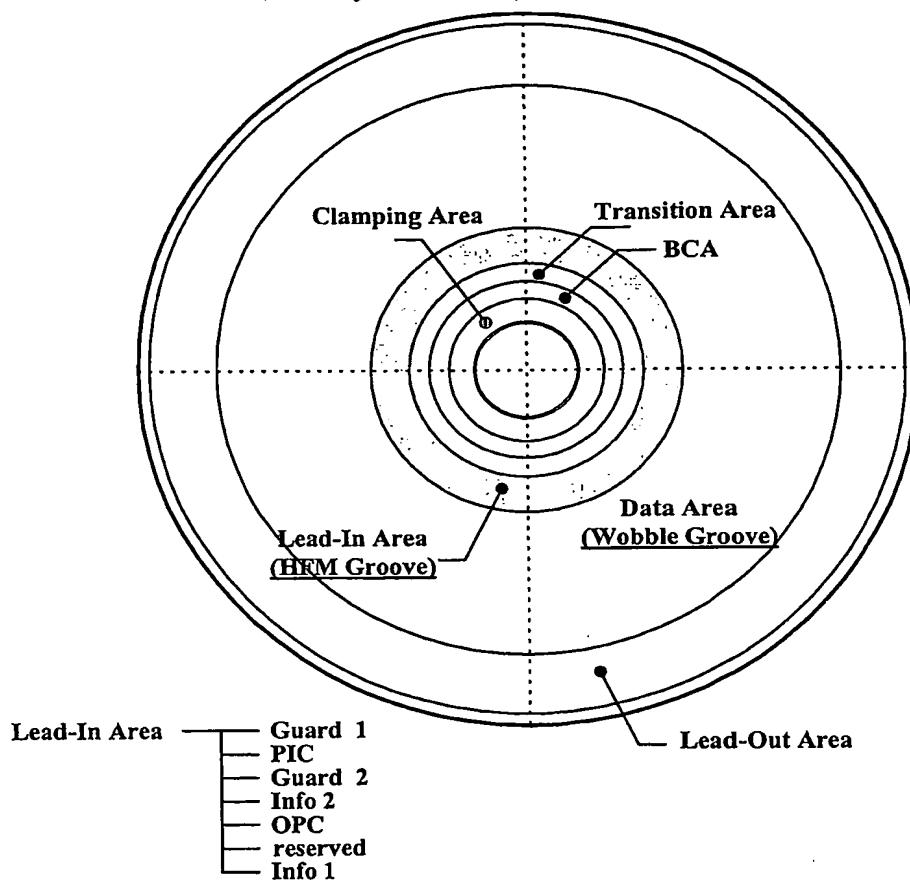
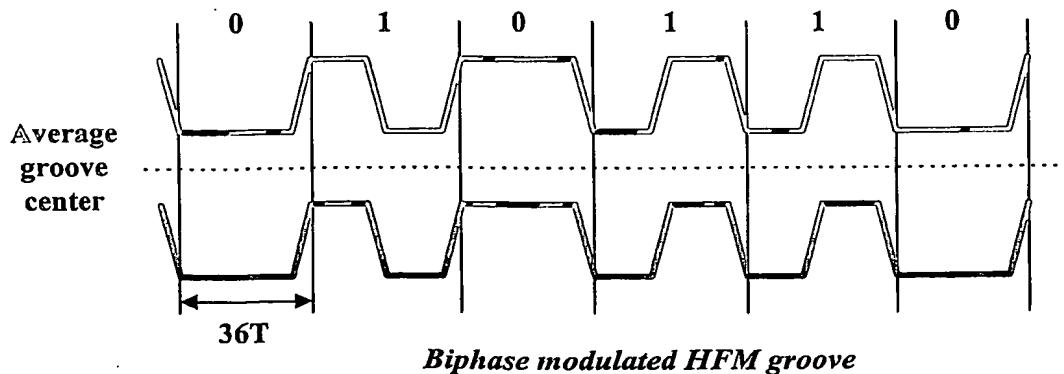
FIG. 1**FIG. 2**

FIG. 3
BD-ROM (Blu-ray ROM)

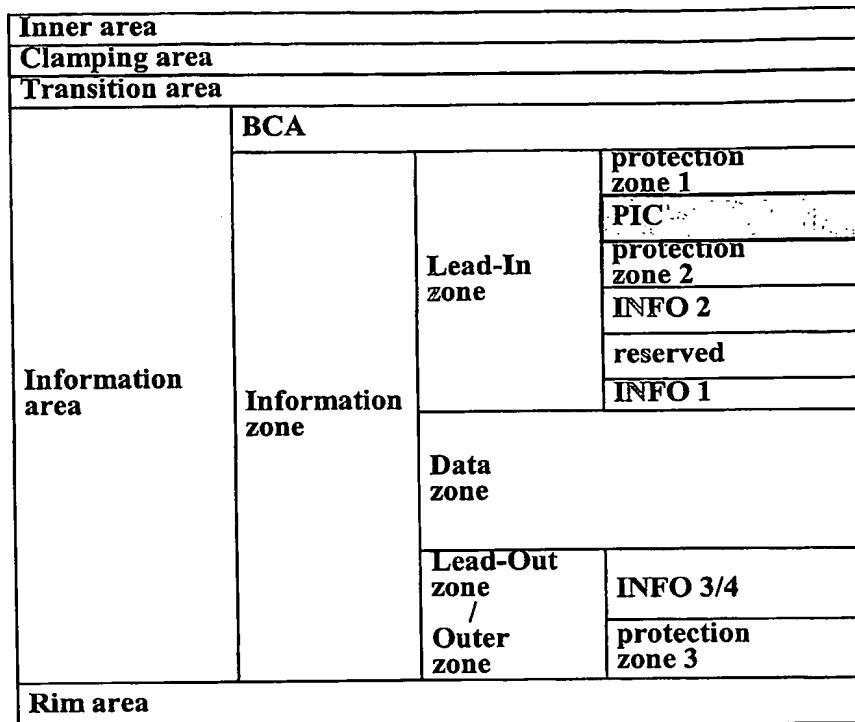
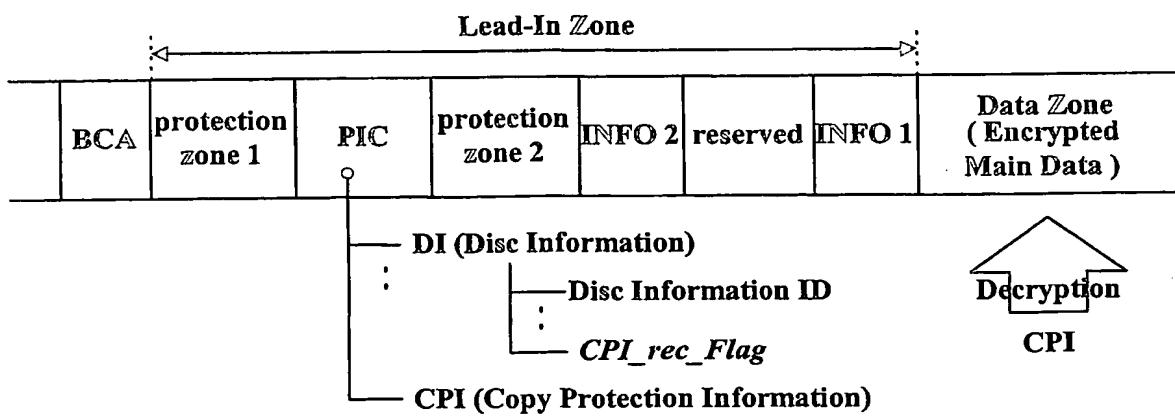
**FIG. 4**

FIG. 5

Byte number	Contents	number of bytes
0	Disc Information identifier = "DI"	2
2	DI format	1
3	Reserved = 00h	1
4	Number of DI frames in each DI Block	1
5	DI Frame sequence number in DI Block	1
6	Number of DI bytes in use in this DI Frame	1
7	Reserved = 00h	1
8 to 10	disc type identifier = "BDO"	3
11	disc size / version	1
12	disc structure	1
13	channel bit length	1
14 to 15	Reserved = all 00h	2
16	BCA descriptor	1
17	maximum transfer rate of application	1
18 to 23	Reserved = all 00h	6
24 to 31	Data zone allocation	8
32 to 111	Reserved = all 00h	13

where *CPI_rec_Flag* (1Byte) is allocated

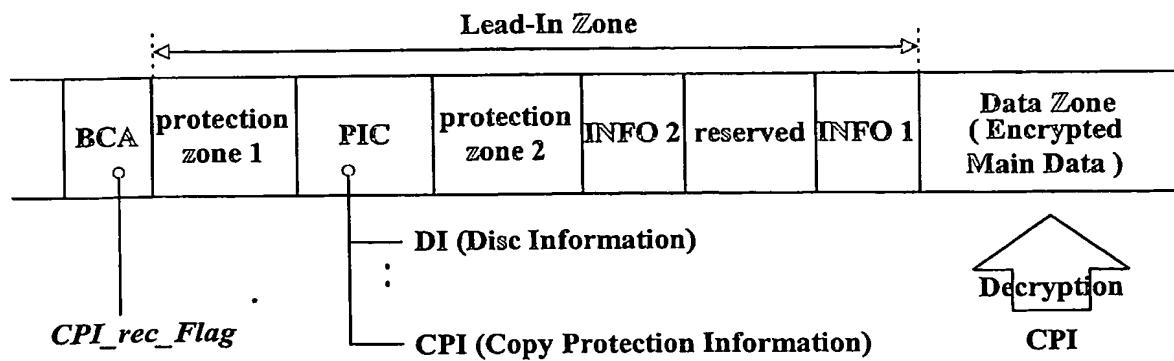
FIG. 6

FIG. 7

Data encoded in Wobbled Pits by Bi-Phase Modulation

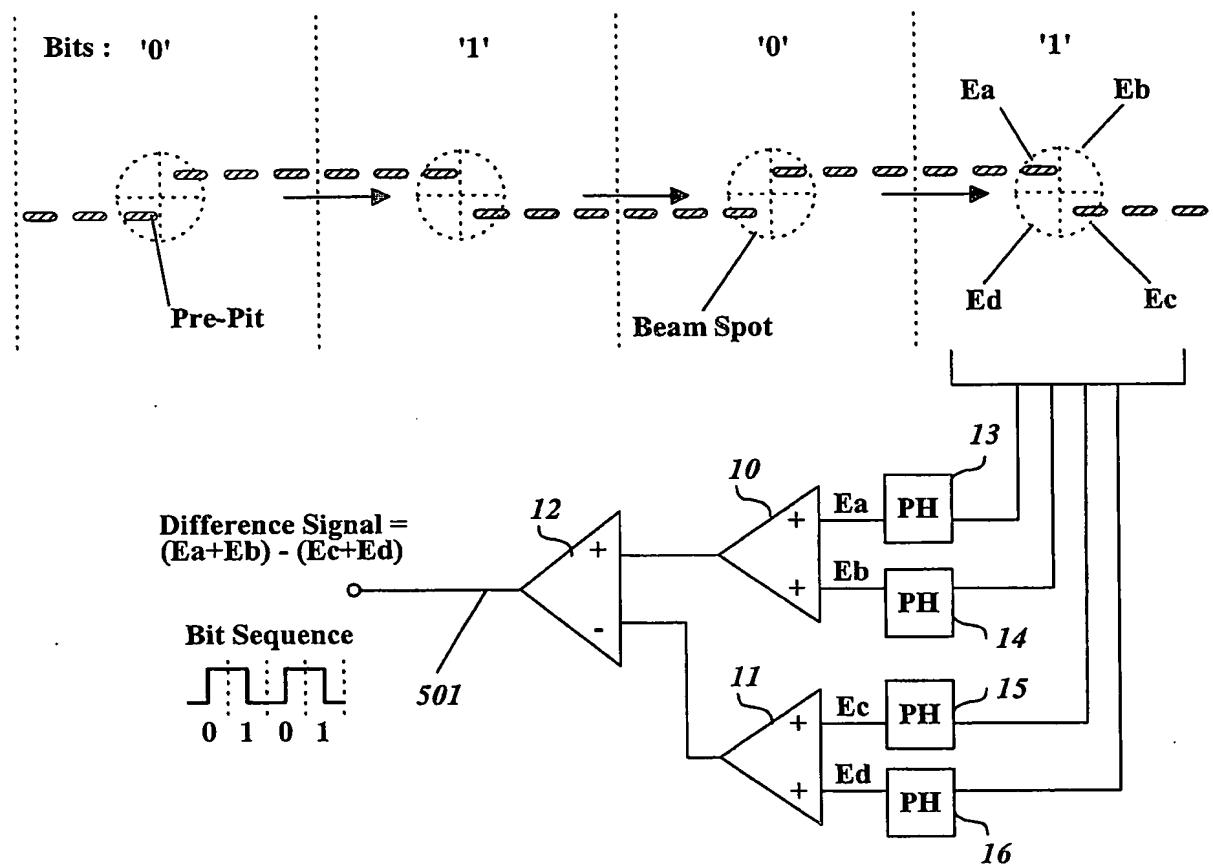


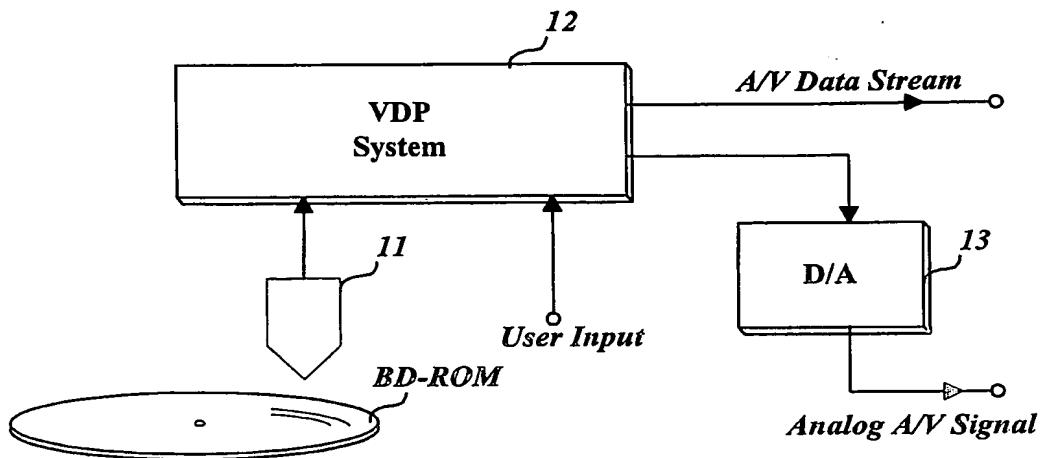
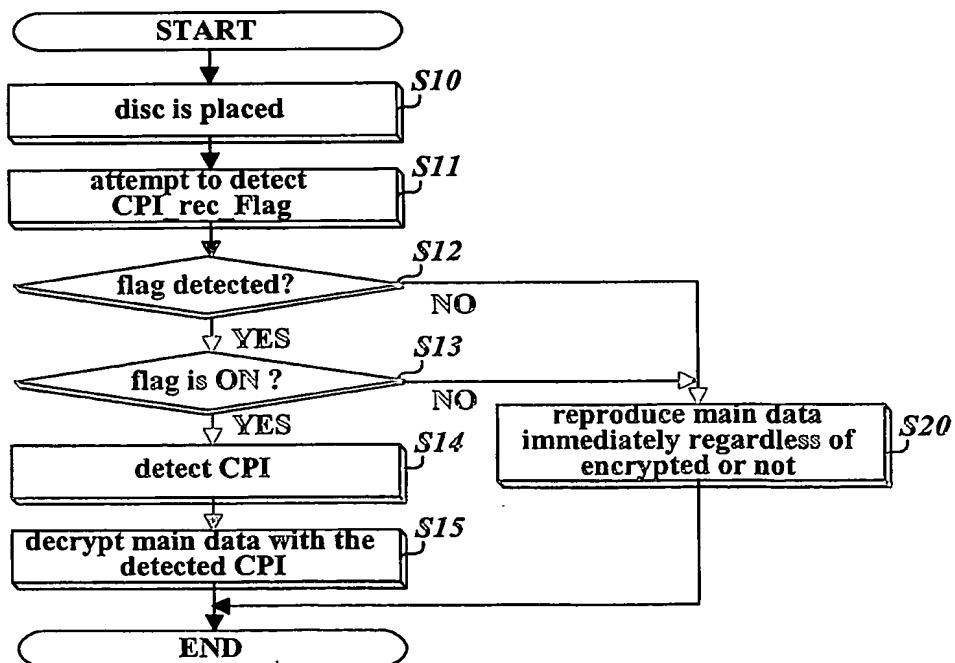
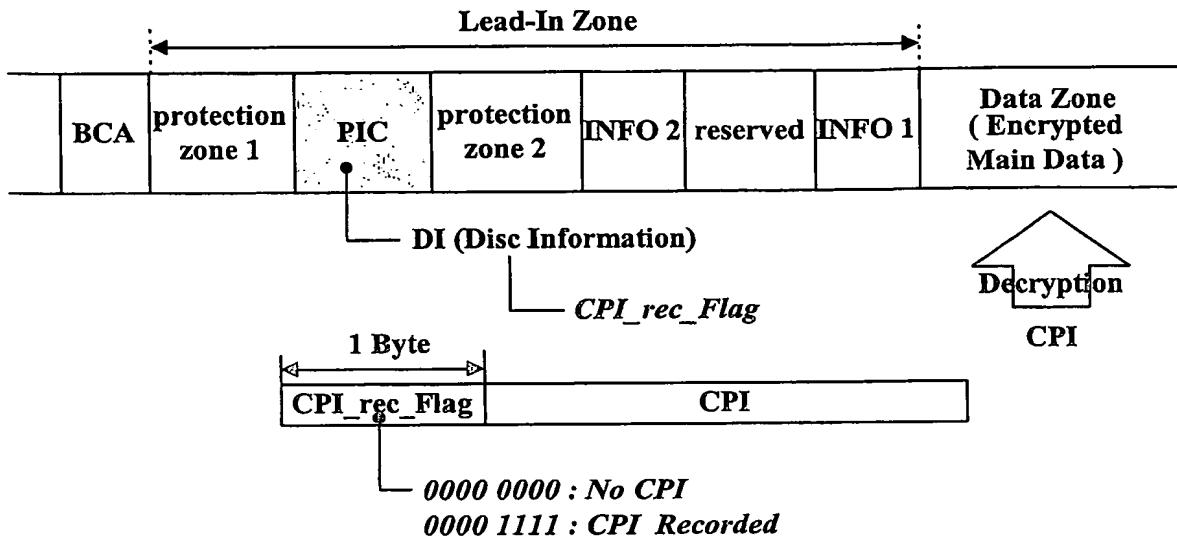
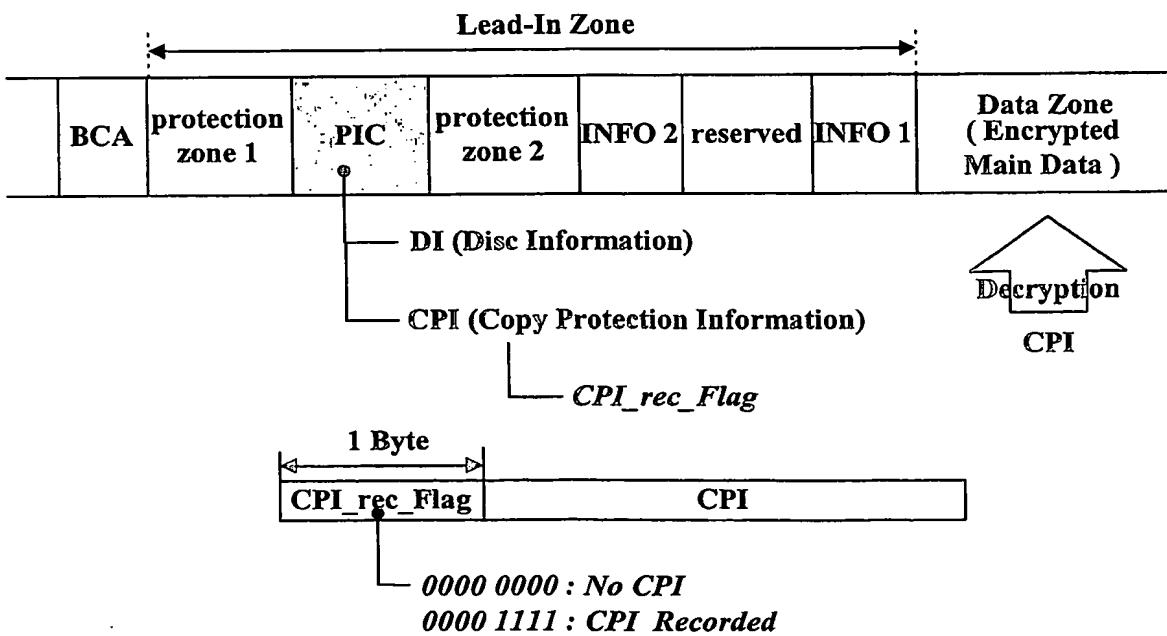
FIG. 8**FIG. 9**

FIG. 10**FIG. 11**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2004/000107

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 G11B 7/007

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G11B 7/00-7/24, G11B20/00-20/24

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI,PAJ"copy protection","wobble","pre-pit"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 10-003746 A(MITSUBISHI ELECTRIC CORP.)06 JANUARY 1998 See the whole document.	1, 7, 13, 19, 30,36
A	JP 14-304809 A(EASTMAN KODAK CO.) 18 OCTOBER 2002 See the whole document	1, 7, 13, 19, 30,36
A	JP 11-86436 A(TOSHIBA CORP.) 30 MARCH 1999 See the whole document	1, 7, 13, 19, 30,36
A	JP 9-128874 A(SONY CORP.) 16 MAY 1997 See the whole document	1, 7, 13, 19, 30,36

Further documents are listed in the continuation of Box C.

See patent family annex.

- * Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed
- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

28 APRIL 2004 (28.04.2004)

Date of mailing of the international search report

29 APRIL 2004 (29.04.2004)

Name and mailing address of the ISA/KR

 Korean Intellectual Property Office
920 Dunsan-dong, Seo-gu, Daejeon 302-701,
Republic of Korea
Facsimile No. 82-42-472-7140

Authorized officer

SONG, Jin Suk

Telephone No. 82-42-481-5694

